WHAT IS CLAIMED IS:

1. A displacement pickup comprising:

a movable scale having defined thereon a first area where positional information is recorded with a predetermined pitch and a second area where positional information is recorded with a pitch different from that in the first area;

a first reading means for reading the positional information recorded in the first area;

a first phase detecting means for detecting a first phase on the basis of the positional information read by the first reading means;

a second reading means for reading the positional information recorded in the second area;

a second phase detecting means for detecting a second phase on the basis of the positional information read by the second reading means;

a phase comparing means for comparing the first and second phases with each other; and

a signal selecting means for generating a plurality of signals according to a result of the comparison from the phase comparing means and selecting an arbitrary one of the plurality of signals on the basis of the positional information read by the first reading means,

the first and second areas being formed on the scale to be displaceable equal distances in the same measuring direction.

2. The apparatus as set forth in claim 1, further comprising an origin signal generating means for generating an origin signal according to the result of comparison supplied from the phase comparing means,

the signal selecting means for determining an interval at which a plurality of origin signals is produced by the origin signal generating means on the basis of the positional information read by the first reading means and selecting the arbitrary signal as an origin signal on the basis of the interval.

3. The apparatus as set forth in claim 1, further comprising a detection level signal output means for providing a signal (will be referred to as "detection level signal" hereunder) corresponding to the detection level of the positional signal read by the second reading means,

the detection level signal output means providing the detection level signal to the signal selecting means; and

the signal selecting means selecting the arbitrary signal as an origin signal on the basis of the positional signal read by the first reading means when the detection level signal has a predetermined value.

4. The apparatus as set forth in claim 1, wherein the scale has the first area defined on one side thereof with respect to the measuring direction and the second area defined at the other side.

5. The apparatus as set forth in claim 1, wherein the scale has the second area defined across the first area.

6. The apparatus as set forth in claim 1, wherein the scale has the first and second areas defined superposed one on the other like layers in the vertical direction.

7. The apparatus as set forth in claim 1, wherein:

the second area has recorded therein the positional information with a pitch displaced a predetermined distance from each other;

the phase comparing means supplies the signal selecting means with a result of comparison corresponding to the displacement of the positional information recorded in the second area; and

the signal selecting means produces a plurality of signals whose recorded pitch varies depending upon the result of comparison and selects an arbitrary one of the plurality of signals on the basis of the positional information read by the first reading means.

8. The apparatus as set forth in claim 1, wherein the second area has recorded therein the positional information with a pitch increased or decreased linearly in the measuring direction.

9. The apparatus as set forth in claim 1, wherein the second area has formed repeatedly in the measuring direction therein a pattern in which the positional information is recorded with the same pitch in the same section and with different pitches in adjacent sections.

10. The apparatus as set forth in claim 9, wherein at least one origin signal is detected from each of the sections.

11. The apparatus as set forth in claim 1, wherein the second area is formed from two sections different in positional-information recording pitch from each other and which are laid repeatedly in a predetermined sequence in the measuring direction.

12. The apparatus as set forth in claim 3, wherein the second area has the positional information recorded with the direction of the grating vector of the latter being displaced a predetermined extent in the measuring direction.

13. The apparatus as set forth in claim 1, wherein the second area has a range readable by the second reading means defined by a predetermined processing for only a limited number of origin signals to be readable.

14. The apparatus as set forth in claim 1, wherein the origin signal generating means further includes a value setting means for setting an arbitrary value so that the origin signal generating means will produce an origin signal when a difference between the first and second phases takes the arbitrary value.

15. The apparatus as set forth in claim 1, wherein the origin signal generating means produces an origin signal only when a difference between the first and second phases is zero.

16. The apparatus as set forth in claim 1, wherein the origin signal generating means produces an origin signal when a difference between the first and second phases has taken a set value a predetermined number of times.

17. The apparatus as set forth in claim 1, further comprising:

a phase selecting means for selecting either the first or second phase; and

a value setting means for setting an arbitrary value so that the origin signal generating means will produce an origin signal when any of the phases selected by the phase selecting means takes the arbitrary value after a difference between the first and second phases takes a set arbitrary value.

18. The apparatus as set forth in claim 17, wherein the origin signal generating means produces an origin signal when the phase selected by the phase selecting means takes a value set by the value setting means in a position after the difference between the first and second phases takes a set value and then the phase difference takes the set value which appears again in a position a predetermined distance apart from the above position.

19. The apparatus as set forth in claim 18, wherein:

the predetermined distance is $(2n + 1)\Lambda/2$ where n is an integer larger than zero and Λ is a pitch with which the diffraction gratings are recorded in the first area in case the first phase difference is selected by the phase selecting means, while being a pitch with which the diffraction gratings are recorded in the second area in case the second phase difference is selected by the phase selecting means.

20. The apparatus as set forth in claim 1, wherein:

the positional information recorded in the first and second areas defined on the scale includes transparent or reflective diffraction gratings;

the first reading means includes a first light source, a first beam splitting means for dividing a light beam from the first light source by two, and a first optical system

in which the two divisional light beams are diffracted by the diffraction gratings and the two diffracted light beams are superposed on each other to provide an electric signal; and

the second reading means includes a second light source, a second beam splitting means for dividing a light beam from the second light source by two, and a second optical system in which the two divisional light beams are diffracted by the diffraction gratings and the two diffracted light beams are superposed on each other to provide an electric signal.

21. The apparatus as set forth in claim 20, wherein:

the first reading means further includes a first reflector to reflect the two divisional light beams diffracted by the diffraction gratings back to the diffraction gratings;

the second reading means further includes a second reflector to reflect the two divisional light beams diffracted by the diffraction gratings back to the diffraction gratings;

the first optical system superposes the diffracted light beams having been diffracted by the diffraction gratings several times; and

the second optical system superposes the diffracted light beams having been diffracted by the diffraction gratings several times.

22. The apparatus as set forth in claim 21, wherein the coherence lengths of the first and second coherent light sources is within 200 μm.

23. The apparatus as set forth in claim 21, further comprising:

a first modulation degree detecting means for detecting a degree of modulation when the two diffracted light beams are caused to interfere with each other in the first optical system;

a first monitoring means for monitoring the change of optical path length difference on the basis of the result of detection from the first modulation degree detecting means;

a second modulation degree detecting means for detecting a degree of modulation when the two diffracted light beams are caused to interfere with each other in the second optical system; and

a second monitoring means for monitoring the change of optical path length difference on the basis of the result of detection from the second modulation degree detecting means.

24. The apparatus as set forth in claim 20, wherein:

the scale is a one having a first area defined thereon and second areas defined thereon on either side of the first area or a one having a first area and second area defined in stack perpendicularly to a direction in which positional information is read by the first and second reading means; and

the optical paths along which the diffracted light beams superposed by the first optical system travel are disposed centrosymmetrically with each other with respect to a direction in which the scale is displaced.

25. The apparatus as set forth in claim 20, wherein:

the first optical system further includes a first adjuster for a maximum ratio of modulation; and

the second optical system further includes a second adjuster for a maximum ratio of modulation.

26. The apparatus as set forth in claim 20, wherein one light source is used in common as the first and second light sources.

27. The apparatus as set forth in claim 20, wherein:

the scale is a one having a first area defined thereon and second areas defined thereon on either side of the first area or a one having a first area and second area defined in stack perpendicularly to a direction in which positional information is read by the first and second reading means;

one light source is used in common as the first and second light sources; and

one beam splitter is used in common as the first and second beam splitters.

28. The apparatus as set forth in claim 20, wherein:

the first light source is connected to the first beam splitter with an optical fiber through which the light beam is guided for incidence upon the first beam splitter;

the first beam splitter is connected to the first optical system with an optical fiber through which the light beam is guided for incidence upon the first optical system;

the second light source is connected to the second beam splitter with an optical fiber through which the light beam is guided for incidence upon the second beam

splitter; and

the second beam splitter is connected to the second optical system with an optical fiber through which the light beam is guided for incidence upon the second optical system.

29. The apparatus as set forth in claim 28, wherein the first and light sources, and the first and second optical systems are provided outside the apparatus.

30. The apparatus as set forth in claim 20, wherein:

the first light source is connected to the first beam splitter with an optical fiber through which the light beam is guided for incidence upon the first beam splitter;

a photodetector in the first optical system is connected to each of other components of the first optical system with an optical fiber through which the light beam is guided for incidence upon the other components;

the second light source is connected to the second beam splitter with an optical fiber through which the light beam is guided for incidence upon the second beam splitter; and

a photodetector in the second optical system is connected to each of other components of the second optical system with an optical fiber through which the light beam is guided for incidence upon the other components;

31. The apparatus as set forth in claim 30, wherein the first and light sources, and the photodetectors in the first and second optical systems are provided outside the apparatus.

32. A displacement pickup in which first phase information having an arbitrary period and second phase information having a period different from that of the first phase information are detected by a pickup head block from a scale to pickup up positional information from the first and second phase information, the apparatus comprising:

a polar coordinate transforming unit which transforms the first and second positional information into angular data indicating positions of the scale and pickup head block in relation to each other and amplitude data;

a phase difference detector which detects a difference between phase data 1 which is the angular data resulted from transformation of the first phase information by the polar coordinate transform unit and phase data 2 which is the angular data resulted from transformation of the second phase information by the polar coordinate transform unit;

a reference phase difference recorder which records, as a reference phase difference, the difference between the first and second phase data 1 and 2 at a time when an arbitrary signal is supplied;

a phase-difference coincidence detector which detects when the per-displacement phase difference detected by the phase difference detector and the reference phase difference recorded in the reference phase difference recorder are coincident with each other;

a phase data recorder which records the phase data 1 and/or 2 at a time when the

coincidence between the phase differences is detected by the phase-difference coincidence detector; and

a reference point signal detector which detects, at each displacement, coincidence between the phase differences and coincidence between the phase data 1 or 2 recorded in the phase data recorder and the phase data 1 or 2 supplied from the polar coordinate transform unit to produce a reference point signal.

33. The apparatus as set forth in claim 32, having a function to provide the reference phase difference recorded in the reference phase difference recorder to outside and change, from outside, the reference phase difference recorded in the reference phase difference recorder.

34. The apparatus as set forth in claim 32, wherein the phase-difference coincidence detector can vary the optimum accuracy of detection by recognizing, as a phase-difference coincidence point, a point where the time for which phase difference and reference phase reference are coincident with each other $\geq$ (1/sampling clock) $\times$ β mm, providing a phase-coincidence signal as an output and changing the coefficient β.

35. The apparatus as set forth in claim 32, having a function to provide phase data 1 or 2 recorded in the phase data recorder is provided to outside and changing, from outside, the phase data 1 and/or 2 recorded in the phase data recorder.

36. The apparatus as set forth in claim 32, wherein an arbitrary value α_1 is added to a phase difference detected by the phase difference detector and the resulted value is recorded as a reference phase value to the reference phase different recorder.

37. The apparatus as set forth in claim 32, wherein an arbitrary value α_2 is added to the phase data 1 or 2 supplied from the polar coordinate transform unit and the resulted value is recorded as a reference phase value to the reference phase different recorder.

38. The apparatus as set forth in claim 32, wherein the reference point signal detector detects and takes as a reference point signal, at each detection of a displacement, a point where the phase data 1 or 2 recorded in the phase data recorder coincides with the phase data 1 or 2 supplied from the polar coordinate transform unit after the phase-difference coincidence detector detects coincidence of phase differences with each other.

39. The apparatus as set forth in claim 32, further comprising a displacement detector which produces and outputs an incremental signal from angular data indicating positions of the scale and pickup head block in relation to each other and amplitude data.